REMARKS

In paragraphs 1, 2 and 3 of the Examiner's Office Action, the Examiner has objected to the specification and has rejected claims 1-6 for the reasons set forth on page 2 of the Examiner's Office Action letter. As the Examiner will note, original claim 1 has been cancelled from the present application and replaced with newly added claims 7 and 8. Also, claims 3, 4 and 6 have been cancelled from the present application and claims 2 and 5 have been amended so as to be dependent from newly added claim 7. Since the new matter issues raised by the Examiner in paragraphs 1 and 3 directly relate to original claim 1, and since claim 1 has been cancelled from the present application, it is believed that these objections and rejections have been eliminated.

Claims 1 and 2 have been rejected by the Examiner under 35 USC 103(a) as being unpatentable over Shikama et al., U.S. Patent 5,718,953. Also, claims 3-5 have been rejected by the Examiner under 35 USC 103(a) as being unpatentable over Shikama et al. in view of Kuze et al., U.S. Patent 4,454,312. These rejections are respectfully traversed.

The present invention is directed to a polyester-based heat-shrinkable tube for covering a condenser for the sake of protection and electrically insulating an electronic condenser.

The polyester-based heat-shrinkable tube for covering a condenser, according to the present invention, comprises a polyester or copolyester resin as a principal component which is combined with external particles. The polyester or copolyester resin as the principal component comprises 80-99 weight percent of copolymer resin which includes 1-15 mol% of polyethylene napthalate and 85-99 mol% of polyethylene terephthalate which has an intrinsic viscosity of 0.65-1.0dl/g mixed with 1-20 weight percent of polybutylene terephthalate resin containing 10-30 weight percent of a pigment. The external particles are present in the polyester or copolyester resin in an amount of 0.01-3 weight percent and have an average particle diameter of 0.5-3.5 μm.

The polyester-based heat shrinkable tube has a slipperiness in the range of 300-800g/f.

Thus, newly added claims 7 and 8 have identified specific components which make up the polyester-based heat shrinkable tube of the present invention which are present in specific amounts and which contain certain properties which are effective in clearly distinguishing the polyester-based heat shrinkable tube of the present invention from the prior art relied upon by the Examiner. Thus, the intrinsic viscosity of the polyethylene naphthalate-polyethylene terephthalate copolyester resin is preferably in the range of 0.65-1.0dl/g to achieve the most desirable mechanical properties. If the intrinsic viscosity is greater than 1.0dl/g, it is impossible to form a thin film having a thickness of less than 150 μm.

In addition, the presence of the external particles changes the crystalinity of the two and hence the properties of the two, such as adherence, dry heat resistance, and the like, and thus the particle size, distribution and content of the external particles are important. The size of the external particles is preferably in the range of 0.5-3.5 μm. If the external particles are smaller than 0.5 μm, the two cannot have an optimized slipperiness. On the contrary, if the external particle is larger than 3.5 μm, the distribution of the external particles is decreased, thereby causing a deterioration in the slipperiness of the tube. Also, the content of the external particles is preferably in the range of 0.01-3 weight percent to guarantee excellence in adherence and dry heat resistance. If the content of the external particles exceeds 3 weight percent, the crystalinity of the tube is sharply reduced to have no shrinkage property, resulting in less adherence of the external particles to the tube.

The amount of the pigment-containing polybutylene terephthalate resin added to the above-mentioned copolyester resin is preferably in the range of 1-20 weight percent. If the amount is less than 1 weight percent, there is no effect on the crystallization speed of the resin

composition. On the contrary, if it exceeds 20 weight percent, the crystallization speed of the resin composition is sharply increased to result in difficulty in forming an oriented tube.

The Shikama et al. reference, U.S. Patent 5,718,953 is directed to a heat-shrinkable tubing formed substantially from a polyphenylene sulfide which can be used as a covering or protective material by utilizing the heat resistance, flame resistance, electrical properties and chemical resistance possessed by polyphenylene sulfide. The heat shrinkable tube of the present invention does not contain polyphenylene sulfide. The Examiner on page 3 of the Office Action letter states that the Shikama et al. patent discloses a shrinkable tube comprising 30 percent by weight of a polyester resin and 2 percent by weight of particles having a diameter of 0.5 μm. Thus, the shrinkable tube of the Shikama et al. patent contains polyphenylene sulfide, a polyester resin and particles. How can the Examiner possibly argue that such a mixture even remotely relates to a copolyester resin containing polyethylene naphthalate and polyethylene terephthalate which is mixed with a specific amount of butylene terephthalate resin containing a specific amount of pigment. There appears to be no recognition in the reference patent of the Applicants' specific composition, the intrinsic viscosity of the copolyester resin, the importance of the size of the external particles and the content of the external particles as defined by the present invention.

In Col. 4, lines 1-18 of the referenced patent, the patentees state that fine particles contained in the tubing have an average particle diameter of 0.01-10 μm. At first sight, this would appear to cover the Applicants' particle size range of 0.5-3.0 μm. However, in line 9 of Col. 4, the patentees state that when a polymer contained in the tubing contains only particles smaller than 4 μm, there can be obtained no remarkable effect in the openability of the tubing. Thus, the patentees appear to teach away from the use of an average particle size of 0.5-3.5 μm as defined by the present invention, which falls below and is smaller than 4 μm referred to by the

patentees. Thus, it would appear that the patentees teach away from using a particle size as defined by the present invention. As noted on page 5, line 24 to page 6, line 4 of the present application and as discussed hereinabove, if the external particle size is larger than 3.5 μm, the distribution of the external particle is decreased causing a deterioration in the slipperiness of the tube. Thus, to dismiss many of the distinctions between the present invention and the Shikama et al. patent by arguing that it would be obvious to optimize the many distinctive parameters recited in the claims of the present application, is to ignore the very essence of the Applicants' inventive contribution.

The Examiner, recognizing the deficiencies in the Shikama et al. patent has further relied upon the Kuze et al. reference, U.S. Patent 4,454,312 when rejecting claims 3-5 of the present application. The Examiner argues that the Kuze et al. patent teaches a copolymer comprising polyethylene napthalate, polyethylene terephthalate and polybutylene terephthalate. Presuming that the Examiner's assertion is correct, the polyester resin of the Kuze et al. patent is a terpolymer, that is a three-component copolymer of phyethylene napthalate, polyethylene terephthalate and polybutylene terephthalate. However, the polyester resin of the present invention is a blend of a copolymer, that is, a two-component copolymer of polyethylene terephthalate and polyethylene napthalate blended with polybutylene terephthalate containing a pigment. Thus, there is a material difference between the three-component copolymer of the Kuze et al. patent and the two-component copolymer-polybutylene terephthalate blend which is recited in claims 7 and 8 of the present application. In this connection, the three-component copolymer comprising the copolymerization of three kinds of polymers is inferior in crystallization speed, thereby causing difficulty in forming an oriented tube due to poor processibility, resulting in an inferior product.

The Examiner on page 5 of the Office Action letter points out that the Kuze et al. patent fails to teach a copolymer containing 1-15 mol% polyethylene napthalate and 85 mol% polyethylene terephthalate mixed with 1-20 percent of polybutylene terephthalate having an intrinsic viscosity of 0.65-1.0dl/g and 0.01–1.1 percent by weight of a metal salt of benzoic acid. To conclude that one of ordinary skill in the art would have recognized the utility of varying the amounts of components in the copolymer, the intrinsic viscosity and the amount of metal salt to obtain a slipping property is to completely discount the Applicants' inventive contributions and to reconstruct the teachings of the references in view of the Applicants' own disclosure.

The Kuze et al. patent discloses a polyester composition comprising a polyester resin and a Zr-containing compound as an internal particle (see Col. 3, lines 8-19) which include alkali metals or alkali earth metals to improve the Zr effect (see Col. 3, lines 44-63; Col. 2, line 67 to Col. 3, line 6). Furthermore, the Examiner states that the Kuze et al. patent includes metal salts of benzoic acid (potassium benzoate) for the purpose of obtaining a composition having excellent slip properties. However, a review of the Kuze et al. patent shows that only a two-component composition is used, that is, Zr plus a phosphorus compound without an alkali metal/alkali earth metal (see Col. 7, lines 28-42) in the field of a polyester-based heat shrinkable tube for covering a condenser. In other words, the present invention utilizes external particles but the Kuze et al. patent uses a Zr-containing compound as an internal particle to obtain a composition having excellent slip properties. In addition, the present invention utilizes a metal salt of stearic acid for the purpose of controlling the crystallization speed of the composition, whereas the Kuze et al. patent does not include alkali metal/alkali earth metals in the polyester-based heat shrinkable tube for covering a condenser.

In view of the multiplicity of differences between the present invention and the Shikama

et al. and Kuze et al. patents, it is clear that neither of these references relied upon by the Examiner, either alone or in combination suggests the Applicants' inventive contributions. Accordingly, reconsideration of the rejections and allowance of all of the claims of the present application are respectfully requested.

Conclusion

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Mr. Joseph A. Kolasch (Reg. No. 22,463) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) respectfully petition(s) for a one (1) month extension of time for filing a reply in connection with the present application, and the required fee of $110.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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